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<b>(21) International Application Number:</b> PCT/US93/04046 <b>(22) International Filing Date:</b> 4 May 1993 (04.05.93)  <b>(30) Priority data:</b> 07/882,610                      13 May 1992 (13.05.92)                      US  <b>(71) Applicants:</b> CHRYSLER CORPORATION [US/US]; 12000 Chrysler Drive, Highland Park, MI 48288 (US). ATOMA INTERNATIONAL, INC. [CA/CA]; 521 Newpark Boulevard, Newmarket, Ontario L3X 4X7 (CA).  <b>(72) Inventors:</b> CZAPSKI, Richard, J. ; 35258 Hathaway Street, Livonia, MI 48150 (US). D'SOUZA, Neville, G. ; 2972 Rhodes Drive, Troy, MI 48083 (US). LLOYD, Rodney, L. ; 3787 Carrie Lane, Commerce Township, Walled Lake, MI 48390 (US). DUKATZ, Matthew, E. ; 1278 Ashover Drive, Bloomfield Hills, MI 48304 (US). FURR, Steven, J. ; 43732 Belleauwood Court, Canton, MI 48188 (US). KRESKY, Fred, C. ; 351 Coldiron Drive, Rochester Hills, MI 48307 (US). LAMBERT, Jef- frey, T. ; 20828 Taft Road, Northville, MI 48167 (US). POPA, George, S. ; 5844 Patterson Drive, Troy, MI 48098 (US). ZAROWITZ, Ronald, S. ; 6045 Shillingham Drive, West Bloomfield, MI 48329 (US). CORKINS, M., Jeffry ; 3181 Granda Vista Drive, Milford, MI 48380 (US).		<b>(74) Agents:</b> LIPPITT, Raymond, F. et al.; Cushman, Darby & Cushman, 1100 New York Avenue, N.W., Washington, DC 20005 (US).  <b>(81) Designated States:</b> AU, CA, JP, KR, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> INTEGRATED CHILD SEAT MODULE  <div> </div> <b>(57) Abstract</b>  A child seat module (16) integrated with a rear vehicle seat (10), and including fold-down lower (19) and upper (20) segments, interconnected by a flexible and detachable hinge (21) and plastic back panel (26) mounted against the back frame of the bench seat. A plastic seat pad support platform (40) is mounted on the inner surface of the lower segment. A pad (90) having seat and back segments is removably mounted on the platform and against the back panel. A safety belt system (22) is operably included in the module. The interconnected lower and upper segments are adapted to being folded down to form, with the platform (40) and pad (90) a child seat cushion and leg support. Alternatively, the leg support (20) may be removed for a child whose size is such that use of the leg support would be uncomfortable.		

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INTEGRATED CHILD SEAT MODULE

## TECHNICAL FIELD OF INVENTION

This invention relates to vehicle seats and more particularly to vehicle seats integrated so as to provide an adult seat in an adult seat mode and a child's seat in a child seat mode.

## BACKGROUND OF THE INVENTION

The type of integrated vehicle seat herein contemplated is the type disclosed in the PCT International Publication WO 92/20549, published May 14, 1992, entitled "Integrated Child Seat for Vehicle". The vehicle seat disclosed in the PCT application is a three-mode seat for a motor vehicle cooperable with an adult seat belt assembly to provide three modes of operation including an adult seat mode, a large child booster seat mode, and a small child mode.

As was indicated in the specification of the PCT application, by providing for both a small child mode and a large child booster seat mode, the integrated seat was able to conveniently accommodate a fairly wide range of children's sizes, thus rendering the integrated seat more useful for a greater number of years and hence more useful to a greater number of family situations. An important feature of the subject matter of the PCT application is the provision of the large child booster seat mode. In this mode, the child seat module is deployed to accommodate the child and the adult seat belt assembly is used to provide restraint; whereas in the small child mode, restraint is provided by the child's seat belt assembly included as part of the child's seat module.

The exemplary embodiment of the three-mode seat, disclosed in publication WO 92/20549, is with

respect to the bench seat of a van-type motor vehicle. In sedan-type motor vehicles, it may be desirable to integrate the back seat so as to provide the child seat mode alternative to the usual adult seat mode. Moreover, it may be desirable to integrate the back seat so that only one child is accommodated in the center of the rear seat. Under these circumstances, it may be difficult to provide sufficient restraint in a third large child booster seat mode simply by utilizing lap belt components. The requirement for restraint is included in United States Motor Vehicle safety Standard No. 213-80. Consequently, it becomes necessary to provide for simple convenient adjustability to child's seat belt assembly embodied in the child seat module to accommodate a full range of sizes.

While the patented literature contains proposals for integrated seats which provide child's seat belt adjustments for accommodating both a large child and a small child, to date there has been no widespread usage of such adjustable integrated arrangements.

One example from the patented literature is Leblanc et al. Patent No. 4,986,600. In the '600 patent, the adjustment is provided by a pair of cleats. Each cleat is comblike in construction including a plurality of tines formed with upturned flanges to prevent the looped ends of the shoulder straps from sliding off. The looped ends of the straps are attached to the tines at the level best suited to the size of the child so that, as the child grows, successively higher tines are used.

The patented literature also contains other disclosures such as those briefly depicted below.

Bailey et al. Patent No. 4,690,455 discloses

an infant seat including a padded support plate with a thin outer cover serving as the back of a bench seat beneath an upper center panel, and which is pivotally lowered onto the usual bench seat, exposing a back support flap sewn to the padded support and a pair of flexible and resilient side flaps attached to the support plate.

British patent application No. 2,023,415 A discloses a vehicle child seat arrangement wherein a child seat having a dish-shaped recess at the forward end thereof to accommodate an infant's legs is pivotally lowered onto the vehicle seat from a walled recess the full height of the vehicle seat back, with shoulder restraint belts extending from the back wall of the recess, leg restraint belts extending from the child seat, and a crotch strap extending from adjacent the bottom of the dish-shaped recess, all connected by a central buckle. Another embodiment includes upper and lower portions integral with the bench seat back and interconnected by a hinge, wherein the upper portion slides downwardly, pivoting about the hinge to fold onto the lower portion once the latter has folded outwardly onto the bench seat.

Offenlegungsschrift 27 20 954 discloses an infant seat substantially in the vertical center of a vehicle seat back which is unlatched to pivot downwardly to a horizontal position spaced apart from the vehicle seat, with two shoulder belts and two side belts extending from the back, and a center crotch belt extending from the front of the infant seat, and all five belts joined at a front central connector.

Hassel Patent No. 4,540,216 includes a child's seat integrally mounted in an automobile seat back and retained therein when closed by closure means, such as a zipper. When unzipped and opened, a

cushion with its outer padding and cover pivots downwardly onto the automobile seat, pulling along with it by means of a center strap a U-shaped arm rest which is retained substantially parallel to the lowered cushion by suitable fixed retained means.

Vaidya Patent No. 4,596,420 discloses a tubular frame within a vehicle seat back, from which oppositely disposed, vertically oriented head support panels are pivotally extended, a torso containment panel is telescopically extended, and a foot support panel is pivoted downward onto the vehicle seat, exposing a fixed molded child seat and back.

Mast et al. Patent No. 2,584,481 discloses an infant's seat which opens from the uppermost portion of an automobile seat back by pivoting a child's seat downwardly to a position spaced above the automobile seat, and pivoting oppositely disposed arm rests downwardly to a position spaced above the child's seat, with suitable pins and grooves for controlling the pivotal movements of the seat and arm rests.

Strahler Patent No. 2,966,201 discloses an infant seat cradle structure encompassing the full height of an automobile seat back, which pivots downwardly onto the automobile seat to expose an elongated trough into which an infant may be confined by straps. When used for toddlers, a separate seat is mounted in and over the inner end of the trough, with belt straps extending from the sides of the recess remaining upon removal of the elongated trough.

Law Patent No. 4,943,112 discloses upper and lower portions of a bench seat back, interconnected by a reinforcing panel, wherein the upper portion folds down about the reinforcing panel, onto the lower portion once the latter folds downwardly onto the

bench seat in the manner of the above-referenced embodiment of the British Application No. 2,023,415 A.

The adjustability provided in the prior art arrangements to accommodate both the small child and the large child suffer from one or more disadvantages including difficulty in effecting the adjustment or, in those instances where adjustability is simplified as in the '600 patent, the arrangement in order to be effective would require strengthening such as to add undesirable weight and cost. There still exists a need in those situations where a three-mode integrated seat, such as disclosed in the WO 92/20549 publication, is not applicable to provide an integrated seat in which a range of child sizes is accommodated by child seat belt adjustment which can be simply and conveniently accomplished with a cost-effective arrangement.

#### SUMMARY OF THE INVENTION

An object of the present invention is to fulfill the above-described need. In accordance with the principles of the present invention, this objective is fulfilled by providing a vehicle seat integrated to selectively provide an adult seat in an adult seat mode and a child's seat in a child seat mode capable of simple and convenient adjustment to selectively accommodate a relatively small child or a relatively large child. The vehicle seat comprises a seat cushion assembly for mounting on a vehicle in a position to enable an adult occupant of the vehicle to sit thereon in an operative position. A rigid seat back frame structure is mounted with respect to the seat cushion assembly in an operative fixed relation. Side cushions are carried by the seat back frame structure in positions to be engaged by opposite sides

of the back of an adult seat occupant sitting on the seat cushion assembly in the operative position thereof. The side cushions are spaced apart a distance sufficient to define a child receiving space therebetween of a size to enable a child to be disposed therebetween. A rigid back panel is fixedly mounted on the seat back frame structure forwardly thereof within a rearward portion of the space between the side cushions. A cushion assembly is mounted on the back panel including movable cushion assemblies mounted for movement between (1) an adult mode position wherein the movable cushion assemblies are disposed within the space between the side cushions and provide adult back cushions for engaging the middle of the back of an adult seat occupant sitting on the seat cushion assembly in the operative position thereof, and (2) a child mode position wherein the movable cushion assemblies extend from the space between the side cushions and the cushion assembly provides a cushioned child's seat extending from the bottom of the space in overlying relation to the seat cushion assembly, a cushioned child's seat back extending upwardly from the cushioned child's seat within the space between the side cushions, and a cushioned child's head support above the cushioned child's seat back. A child's seat belt assembly is connected with the back panel including a pair of shoulder belts extending forwardly of the cushioned child's seat back for extension over the shoulders of a small child sitting on the cushioned child's seat. The cushioned child's seat provides a rigid anchor point for the child's seat belt assembly between the legs of a child sitting on the cushioned child's seat. Adjustment is provided for enabling the pair of shoulder belts of the child's seat belt assembly to be



conveniently moved into a plurality of vertically spaced positions with respect to the child's seat back to selectively accommodate a relatively small child or a relatively large child by simply manually grasping the shoulder belts extending forwardly of the cushioned child's seat back and moving them selectively into one of the plurality of vertically spaced positions. The adjustment comprises two horizontally spaced and generally horizontally aligned pairs of vertically spaced belt receiving restraint slots formed in the rigid back panel. Each pair of restraint slots has a transfer slot extending from one of the restraint slots to the other of the restraint slots so as to define a cantilevered portion in the rigid back panel between the associated pair of restraint slots. A brace is connected between each cantilevered portion and the seat back frame structure for providing support from the seat back frame structure directly to each cantilevered portion while allowing the associated shoulder belt to be selectively moved within the associated transfer slot between the associated pair of slots.

Another object of the present invention is to provide an integrated vehicle seat of the type described which is particularly useful as the high back seat of a family sedan-type motor vehicle. In accordance with the principles of the present invention, this objective is accomplished by providing a vehicle seat integrated to selectively provide an adult seat in an adult seat mode and a child's seat in a child seat mode. The vehicle seat comprises a seat cushion assembly operable to be mounted in a position within the vehicle to enable an adult occupant of the vehicle to sit thereon in an operative position. A rigid seat back frame assembly is mounted within the

vehicle with respect to the seat cushion assembly in an operative fixed relation. Side cushions are carried by the seat back frame means in positions to be engaged by opposite sides of the back of an adult seat occupant sitting on the seat cushion assembly in the operative position thereof. The side cushions are spaced apart a distance sufficient to define a child receiving space therebetween of a size to enable a child to be disposed therebetween. A cushion assembly is mounted on the seat back frame assembly including movable cushion assemblies mounted for movement between (1) an adult mode position wherein the movable cushion assemblies are disposed within the space between the side cushions and provide adult back cushions for engaging the middle of the back of an adult seat occupant sitting on the seat cushion assembly in the operative position thereof, and (2) a child mode position wherein the movable cushion assemblies extend from the space between the side cushions and the cushion assembly provides a cushioned child's seat extending from the bottom of the space in overlying relation to the seat cushion assembly, a cushioned child's seat back extending upwardly from the cushioned child's seat within the space between the side cushions, and a cushioned child's head support above the cushioned child's seat back. The movable cushion assemblies include a pair of movable cushion assemblies movable together between (1) the adult mode position wherein a lower one of the pair of movable cushion assemblies extends upwardly and has an upper one of the pair of movable cushion assemblies extending thereabove and (2) the child mode position wherein the lower movable cushion assembly extends forwardly and has the upper movable cushion assembly extending forwardly and has the upper movable cushion assembly extending forwardly therefrom. The pair of movable

cushion assemblies are interconnected for movement together and for limited articulating movement with respect to one another so as to accommodate different relative angular positions of abutment when in the adult mode and the child mode positions. A child's seat belt assembly is connected with the seat back frame assembly including a pair of shoulder belts extending forwardly of the cushioned child's seat back for extension over the shoulders of a small child sitting on the cushioned child's seat. The lower movable cushion assembly provides a rigid anchor point for the child's seat belt assembly between the legs of a child sitting on the cushioned child's seat.

Another object of the present invention is the provision of a child's seat module for use with a seat cushion assembly a seat back assembly modified to accept the child's seat module which embodies therein the features heretofore discussed.

A general object of the invention is to provide an improved child restraint system which is integrated with a motor vehicle or aircraft seat and in compliance with Motor Vehicle Safety Standards. This system is for a child weighing more than 20 pounds.

Another object of the invention is to provide an improved child restraint system including a fold-down seat cushion and leg support interconnected by a flexible hinge, with a suitable safety harness.

A further object of the invention is to provide such a an improved child restraint system wherein the cavity from which the seat cushion and leg support are removed serves as the back and side supports for the toddler.

Still another object of th invention is to

provide a module that can be installed in a motor vehicle or aircraft seat for permanent installation therein, giving the appearance of a full bench seat, without requiring an upward-folding or removable segment.

A still further object of the invention is to provide an integrated child seat module for a vehicle seat including an interconnected fold-down seat cushion and leg support, with back and side supports provided by the recess from which the seat cushion and leg support are lowered, and a safety harness including either a three-point belt system with twin shoulder belts and a crotch belt, or a five-point belt system, wherein two additional belt extensions are adapted to being mounted over the thighs of the child.

Still another object of the invention is to provide a child restraint system including a fold-down seat cushion and leg support, with provisions for removing the leg support if desired for a particular size child.

These and other objects and advantages will become more apparent when reference is made to the following drawings and the accompanying description.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a vehicle seat and back embodying the inventive integrated child seat module in its stored position;

Figure 2 is a fragmentary perspective view of the seat with the inventive integrated child seat module opened up into its in-use configuration;

Figure 3 is an enlarged perspective and partially exploded view of the child seat module portion of Figure 2;

Figure 4 is an enlarged perspective view of a pad adapted to being mounted on the child seat module back panel and seat support pan of Figure 3;

5 Figure 5 is a perspective view of the child seat module and a five-point safety harness which may be used therewith;

Figure 6 is an exploded, perspective view of the child seat module support platform together with a portion of a five-point safety harness;

10 Figure 7 is a perspective view of the underside of the support pan of Figure 6;

Figure 8 is a fragmentary, exploded, perspective view of the child seat bottom portion;

15 Figure 9 is an enlarged cross-sectional view taken along the plane of the line 9-9 of Figure 5, and looking in the direction of the arrows;

20 Figure 10 is a side elevational view taken along the plane of the line 10-10 of Figure 5, and looking in the direction of the arrow, with a portion thereof in an opened-up condition;

Figure 11 is an enlarged cross-sectional view taken along the plane of the line 11-11 of Figure 10, and looking in the direction of the arrows;

25 Figure 12 is an enlarged cross-sectional view taken along the plane of the line 12-12 of Figure 2, and looking in the direction of the arrows;

Figure 13 is a fragmentary view taken along the plane of the line 13-13 of Figure 12, and looking in the direction of the arrows;

30 Figure 14 is an enlarged view of a portion of the Figure 12 structure;

Figure 15 is a cross-sectional view taken along the plane of the line 15-15 of Figure 14, and looking in the direction of the arrows;

35 Figure 16 is an enlarged, fragmentary view

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taken along the plane of the line 16-16 of Figure 12, and looking in the direction of the arrows;

Figure 17 is a side view, in partial cross section of a vehicle seat structure embodying the invention;

Figure 18 is a fragmentary view taken along the plane of the line 18-18 of Figure 17, with portions thereof broken away, and looking in the direction of the arrows;

Figure 19 is a cross sectional view taken along the plane of the line 19-19 of Figure 18, and looking in the direction of the arrows;

Figure 20 is a plan view of a portion of the Figures 17 and 21 structure;

Figure 21 is a fragmentary view taken along the plane of the lines 21-21 of Figure 17, with portions thereof broken away, and looking in the direction of the arrows;

Figure 22 is a perspective view showing an alternate embodiment of a portion of the invention;

Figure 23 is an enlarged cross-sectional view taken along the plane of the line 23-23 of Figure 22, and looking in the direction of the arrows;

Figures 24-27 illustrate the steps involved in the operation of a feature of the invention; and

Figure 28 is a view similar to Figure 4 showing a modified pad.

#### BEST MODE OF CARRYING OUT THE INVENTION

Referring now to the drawings in greater detail, Figure 1 illustrates a vehicle bench seat 10 having a seat cushion assembly 12 and a seat backrest assembly 14. Either one or two side-by-side toddler or child seat modules 16, integrated with the backrest assembly 14, provides a retractable fold-down,

1 articulated seat back section 18 adapted for swinging  
movement in and out of a recess provided in the  
backrest assembly 14. As best seen in Figures 2 and  
11, the articulated seat back section 18 includes a  
5 first movable cushion assembly or bolster segment 19  
and a second movable cushion assembly or bolster  
segment 20 which are articulated at their outer  
adjacent opposed edges by a suitable flexible and  
detachable hinge 21. The detachable hinge 21 may  
10 include suitable separable fastener means, such as a  
slide fastener (Fig. 23) or a zipper for detaching the  
second bolster segment 20. The zipper may be covered  
by a flap 25 (Figures 12 and 16). The first cushion  
segment 19 has one side adapted to serve as a back  
15 support in an adult seating mode and its other side as  
a seat bottom in a child seating mode. The second  
bolster segment 20 has one side adapted to serve as a  
upper back support in an adult seating mode and its  
other side as a leg support in a child seating mode.

20 With reference to Figure 2, the articulated  
seat back section 18 may be pivoted downwardly from  
the backrest 14 about a transverse pivot axis "A"  
(Figure 3) adjacent the first cushion segment 19 lower  
rear end thereof, to form a modular child seat 22  
25 (Figure 2), while leaving adjacent backrest sections  
23 and 24 of the seat backrest 14 intact.

A back panel 26, formed of suitable  
structural plastic material, such as glass reinforced  
polypropylene for example, is secured to seat support  
30 means, such as a back wall 30 (Figures 12, 18 and 19),  
by suitable bracket means 32, as will be explained.  
The bottom end portion of the back panel 26 is secured  
to the front legs of a pair of substantially Z-shaped  
seat back 27 brackets (Figures 17 and 18) (ne  
35 adjacent each lower corner of the back panel) by

fasteners 28. The brackets 27, in turn, are secured in any suitable manner, such as by rivets or welding, to the front side of respective vertically oriented straps 29. The upper end portions of the straps 29 are secured in any suitable manner, such as by welding, to the back side of a J-shaped lower cross bar 34. The straps 29 are adjacent a vehicle floor pan 35 (Figure 17). An adult seat belt 33a is secured to a clip 33b which, in turn, is secured by a fastener 33c to each strap 29.

The modular child seat assembly 22 is shown in Figure 3 and includes the articulated seat back section 18 together with the back panel 26. As an initial step to forming the child seat of Figure 2, the articulated seat back section 18 is withdrawn from the backrest 14. The articulated seat back section 18 is moved into its child supporting in-use Figure 2 position by folding down the seat back section 18 from a generally rectangular shaped backrest recess defined by the child seat back panel 26 and a pair of rearwardly extending, recess side walls 36 and 38. The side walls 36 and 38 are formed by the inboard opposed sides of the respective backrest side cushions or sections 23 and 24.

With reference to Figure 8, the back support first cushion segment or child seat bottom 19 includes a rectangular seat pad support platform 40, formed of suitable structural plastic material. As best seen in Figure 9, the support platform 40 has a central planar portion 42 bordered by a peripheral downwardly offset frame-like ledge portion 44 extending therearound. An endless trough or slot 46 is formed in the top surface of the platform 40 located a predetermined distance inside the outer perimeter thereof, providing a continuous boundary between the central portion 42 and



the ledge portion 44, for a purpose to be described.

As seen in Figures 6, 8 and 10, a pair of perpendicularly extending mounting flanges 45 are formed adjacent the rear corners of the plastic support pan 40 with axially aligned openings 47 formed therein. The openings 47 are adapted to having suitable fasteners 48 (Figure 10) extended therethrough to pivotally secure the platform 40 to suitable mounting brackets 50 (Figure 12) fixedly secured to extend from the module back panel 26.

A crotch belt 54 extends longitudinally beneath the seat pad support platform 40, and thence upwardly through openings 56 and 58 (Figure 6) formed therein, to be secured at the rear end thereof by a suitable mounting bracket or plate 60. The bracket 60 is secured to the platform 40 by suitable fasteners 61 (Figure 6). A conventional seat belt buckle 62 is secured to the exposed forward end of the belt 54.

As shown in Figure 5, a single adjust belt 72 extends through a slotted opening 74 formed in the back panel 26 and is connected to a safety harness including a T-bar 76 and twin shoulder belts 78 and 80 extending through respective horizontally disposed restraint slots 82 and 83 in the back panel 26 and thence through a releasably interconnected guide member 84 and slotted ends of a pair of opposite hand connector members 85. The latter are adapted to be releasably connected to the buckle 62. The extensions 87 and 88 of the respective belts 78 and 80 are secured by brackets 89 to the mounting flanges 45. The extensions 87 and 88 serve to mount over the child's thighs.

A pad 90 (Figure 4) having a suitable sheet cover formed from flexible material such as vinyl (Figure 4), includes respective front and back segments

92 and 94 connected by a flexible hinge 96 and is removably mounted against the support platform 40 and back panel 26, as shown in Figure 3. A rectangular opening 100 is formed in the seat segment 92 for mounting around the crotch belt 54 out of the plastic seat support platform 40, and the upper edge 102 of the back segment 94 fits against the back panel 26 up to a point just above the openings 82 and 83. As shown in Figures 3 and 4, a strip of Velcro 140a, or other suitable hook or loop tape strips, is mounted on the back side of the pad 90, adapted to engage a mating Velcro or other suitable strip 140b mounted on the back panel 26 to retain the pad 90 in its upright position.

Figure 28 shows an alternate pad 90' covered with suitable cloth or woven material wherein at least the backside portion has a pile-like outer surface adapted for engagement by a suitable hook-type Velcro strip.

As shown in Figure 9, an outer cloth or other material, such as vinyl or leather, cover 106 is wrapped around the cushion segment 19. A plurality of spaced holes 108 are formed in the plastic seat pad support platform 40 intermediate the trough 46 and the edges of the ledge portion 44. A flat retainer 110 includes a flange 112 formed on the inner edge thereof, and suitable fasteners 114 extend through openings 115 formed at spaced intervals along the center line thereof, and thence through the cover 106 into the seat bottom 19. The fasteners 114 are aligned with, and snap into, the holes 108. The cover 106 is wrapped around the flange 112 and retained thereby when projected into the trough 46, as shown at the left side of Figure 9.

Mating Velcro strips or other suitable hook

and loop tape strips 116a (Figure 4) and 116b (Figure 6) are respectively secured to the underside of the seat segment 92 and the upper side of the plastic seat support platform 40, respectively, to hold the seat segment in place. In the case of pad 90', having a cover with a fabric-like pile outer surface, the strips 116a (Figure 4) are not required, and the strip 116b is a hook-type strip.

After use, and when no toddler is on board, the leg support 20, the cushion segment 19, and the associated support platform 40 are folded up in an arcuate motion to resume the function of being a portion of a normal motor vehicle or aircraft seat back against the back panel 26 between the sides 36 and 38, to complete the seat back structure.

As shown in Figures 5-11, the belts 78 and 80 connect through the T-bar 76 (Figure 6) to the belt 72. The latter extends beneath the plastic support platform 40 and through a front opening 122 and the rear opening 58. It passes through a flat bracket 124 (Figures 6 and 11) prior to exiting through the opening 122 (Figures 6 and 10), wherein it may be retained in position by a serrated surface 126 (Figure 10), serving as a tension adjuster on a cross member 128 which is pivotally mounted on a pin 130 (Figure 11) between oppositely disposed side walls 131 of the bracket 124. A coil spring 132 operatively connected between the cross member 128 and the pin 130 retains the serrated surface 126 in a gripping engagement against the adjust belt 72 until a shoulder adjustment pull strap 134 extending through the front opening 122 is pulled forward to pivot the cross member 128 and thereby release the adjust belt 72 and permit it to be pulled to tight n the shoulder belts 78 and 80 around the child. The pull strap 134 is mounted around a bar

136 connected to forward edges of the cross member 128 by levers 138. A belt tab 140 (Figure 6) is secured at the end of the adjust belt 72 to facilitate the pulling-to-tighten process.

5 Referring now to Figure 13 and once again to Figures 3 and 5, it is noted that the pair of restraint slots 82 and 83 are the lowermost lateral openings of respective vertical transfer slots 142 and 144. The latter vertical slots communicate at their  
10 upper ends with diagonally oriented, upwardly extending converging slots 146 and 148 and lateral slots 150 and 152. The latter lateral slots extend to respective downward inlet openings 154 and 156 communicating with lateral openings 158 and 160. The  
15 two sets of slots are formed in the panel 26. When it is necessary to accommodate a larger child, the twin shoulder belts 78 and 80 are moved out of the pair of restraint slots 82 and 83 respectively (Figure 24), into the vertical slots 142 and 144 and thence into  
20 the diagonal slots 146 and 148 (Figure 25). The trailing edges of the belts 78 and 80 are then moved into the lateral openings 150 and 152 (Figure 26), to the inlet openings 154 and 156 for seating the belts in the lateral openings 158 and 160 (Figure 27). As  
25 shown in Figure 4, the back segment 94 of the pad 90 includes only horizontal slots 168/170, and horizontal slits 172/174 continuing from the respective slots 168 and 170, to accommodate the adjustment of the belts 78 and 80 in the various two pair of restraint slots  
30 82/83 and 158/160 and vertical slots 142/144 of the back panel 26.

A close-out cover assembly 175 (Figures 12 and 14) is pivotally mounted on an inverted J-shaped upper cross bar 176 (Figure 14) overlying the upper  
35 portion of the back panel 26. The cover assembly 175

includes foam material 177 covered on the back side thereof with a plastic backing 178 having a substantially C-shaped clamp 179 end portion adapted to flex so as to snap over the upper cross bar 176, as shown in Figure 14. A cover 180 of a suitable material, such as cloth fabric, covers the front side of the foam material 177 and a portion of the back side of the C-shaped clamp 179. The cover 180 wraps around the lower front end of the foam material 177, to extend along the lower end of the plastic backing 178. A stiffener panel 182 is mounted intermediate the foam material 177 and the portion of the cover 180 adjacent the plastic backing 178, secured by staples or stitches 184, as required, for a purpose to be described. As shown in Figure 15, snap-in fasteners 186 are formed on the plastic backing 178, so as to be secured to the back panel 26 by snapping through openings 188 formed in the back panel.

As shown in Figures 2 and 3, strips of Velcro 39a, or other suitable hook end loop tape strips, are mounted on the back side of the second bolster segment 20, adapted to engage mating Velcro or other suitable strips 39b mounted on the lower front edge of the cover member 180, as shown in Figures 14 and 17, to retain the seat back section 18 in its upright position, intermediate the recess side walls 36 and 38.

When the seat back section 18 is down in the child usable position, and it is desirable to change the location of the twin shoulder belts 78 and 80 in the two pair of restraint slots 82/83 and 158/160 (Figure 5), the lower portion of the close cover assembly is lifted up, bending about a line represented as 189 in Figure 14, and moving the belts into or out of the slots 168/170 of the pad 90 (Figure

4) or slots 168'/170' of the pad 90' (Figure 28) through the respective slits 172/174 or 172'/174'.

Referring now to Figures 17-21, the fastening means for securing the back panel 26 to the back wall 30 via the brackets 32 is shown in more detail.

One leg 190 (Figure 19) of each of two brackets 32 is secured by a suitable fastener 192 to the back panel 26, while the other leg 194 of the bracket is secured by a suitable fastener 196 to respective vertical support members 198 (Figure 18). As shown in Figures 17, 18 and 21, the vertical support members 198 are secured at the lower end thereof to the lower J-bar 34 and at the upper end thereof to the upper inverted J-bar 176. The end portion 200 (Figure 19) of the bracket 32 is abutted against the inside of the back wall 30, and a backing or mounting plate 202 (Figure 20) is abutted against the other or rear trunk side of the back wall 30, and secured thereto by suitable fasteners 204. Tabs 203 (Figure 20) are formed adjacent the ends of the mounting plate 202, for mounting in projections 205 (Figure 19) formed by punching out back wall 30. Aligned openings 206 (Figure 20) are formed through the backing or mounting plate 202, such that the fasteners 204 are mounted therethrough (Figure 19) to complete the securing of the seat back panel 26 to the back wall 30.

A T-bar retention panel 208 (Figures 17 and 21) is mounted on upper and lower projections 210 and 212 (Figure 17) by fasteners 214 and 216 (Figure 21) on the back of the back panel 26. As shown in Figure 21, the T-bar 76 is slidably confined between the retention panel 208 and the back panel 26. The single seat belt 72 extends downwardly from the T-bar 76 to

exit from the lower end of the panel 208, while the twin shoulder belts 78 and 80 extend upwardly from the T-bar on opposite sides of the panel, to the pair of restraint slots 82/83 or 158/160.

5           Referring now to Figures 22 and 23, in lieu of the zipper-type flexible and detachable hinge 21 of Figures 3 and 16, a slide fastener assembly 220 is disclosed. The assembly 220 includes a first member 222 having a central U-shaped track 224 with inturned ends 226, and lateral extensions 228 secured by suitable fastener means, such as stitching 230, to folded trim ends of the upper or first bolster segment 19, and a second member 232 secured by stitching 230, or the like, at one edge 234 thereof to a folded trim end 236 of the lower or second bolster segment 20, with a flanged longitudinal protrusion 238 formed at a central location for sliding cooperation with the U-shaped track 224 and inturned ends 226. The second member 232 includes an end 240 opposite the edge 234 which is U-shaped to receive the other folded trim end 242 of the second bolster segment 20. More specifically, an inturned end 244 is formed on the distal end of the U-shaped end 240, with a projection 246 formed on the inner surface of the second member 232 opposite the inturned end 244. An extruded strip 248 having a barb 250 formed on one end thereof is secured at the other end 252 thereof by fastening means, such as stitching 254. As such, the barb 250 is forced through the opening between the inturned end 244 and the projection 246 to secure the folded trim end 242 to the second member 232. With this construction, the flanged protrusion 238 slides through the track 224 to alternately engage and disengage the two bolster segments 19 and 20.

## INDUSTRIAL APPLICABILITY

It should be apparent that the invention provides a compact and efficient child restraint system for incorporation as an integrated module of a motor vehicle or aircraft seat structure.

It should also be apparent that, if desired, two such integrated child seat modules could be incorporated in a spaced apart arrangement in the back bench seat structure of a motor vehicle or aircraft.

While but one general embodiment of the invention has been shown and described, other modifications thereof are possible within the scope of the following claims.



## WHAT IS CLAIMED IS:

1. A vehicle seat integrated to selectively provide an adult seat in an adult seat mode and a child's seat in a child seat mode capable of simple and convenient adjustment to selectively accommodate a relatively small child or a relatively large child, said vehicle seat comprising
- 5 a seat cushion assembly for mounting on a vehicle in a position to enable an adult occupant of the vehicle to sit thereon in an operative position,
- 10 a rigid seat back frame structure, means for mounting said rigid seat back frame structure with respect to said seat cushion assembly in an operative fixed relation,
- 15 side cushions carried by said seat back frame structure in positions to be engaged by opposite sides of the back of an adult seat occupant sitting on said seat cushion assembly in said operative position,
- 20 said side cushions being spaced apart a distance sufficient to define a child receiving space therebetween of a size to enable a child to be disposed therebetween,
- a rigid back panel,
- 25 means for fixedly mounting said back panel on said seat back frame structure forwardly thereof within a rearward portion of the space between said side cushions,
- 30 cushion assembly means mounted on said back panel including movable cushion assembly means mounted for movement between (1) an adult mode position wherein said movable cushion assembly means is disposed within the space between said side cushions and provides adult back cushion means for engaging the middle of the back of an adult seat

occupant sitting on said seat cushion assembly in said operative position, and (2) a child mode position wherein said movable cushion assembly means extends from the space between said side cushions and said cushion assembly means provides a cushioned child's seat extending from the bottom of the space in overlying relation to said seat cushion assembly, a cushioned child's seat back extending upwardly from said cushioned child's seat within the space between said side cushions, and a cushioned child's head support above the cushioned child's seat back,

a child's seat belt assembly connected with said back panel including a pair of shoulder belts extending forwardly of said cushioned child's seat back for extension over the shoulders of a small child sitting on the cushioned child's seat,

said cushioned child's seat providing a rigid anchor point for the child's seat belt assembly between the legs of a child sitting on said cushioned child's seat, and

means for enabling the pair of shoulder belts of said child's seat belt assembly to be conveniently moved into a plurality of vertically spaced positions with respect to said child's seat back to selectively accommodate a relatively small child or a relatively large child by simply manually grasping the shoulder belts extending forwardly of said cushioned child's seat back and moving them selectively into one of said plurality of vertically spaced positions,

said means for enabling said movement of said shoulder belts comprising a plurality of horizontally spaced and generally horizontally aligned pairs of vertically spaced belt receiving restraint slots formed in said rigid back panel, each pair of

restraint slots having a vertical transfer slot extending from one of said pair of restraint slots to the other of said slots so as to define a cantilevered portion in said rigid back panel between the associated pair of vertical transfer slots, said rigid back panel mounting means including brace means connected between each cantilevered portion and said seat back frame structure for providing support from said seat back frame structure directly to each cantilevered portion while allowing the associated shoulder belt to be selectively moved within the associated vertical transfer slot between the associated pair of slots.

2. A vehicle seat as defined in claim 1 wherein said lower movable cushion assembly includes a support platform, said safety belt means including a crotch belt secured at one end thereof to said support platform, a buckle secured to the distal end of said crotch belt, said pair of shoulder belts having connector means operatively connected thereto adapted to snap into secured cooperating relation with said pair of shoulder belts selectively through a pair of restraint slots selected from each of said plurality of pairs of restraint slots in said back panel adapted to connect with a dividing bracket, a single belt extending from said dividing bracket through said back panel and downwardly through a lower opening in said support platform and then upwardly through a front opening in said support platform with the free end thereof free to be manually gripped, and tension adjuster means operatively connected to said single belt beneath said support platform intermediate said front and rear openings therein.

3. A vehicle seat as defined in claim 2 wherein said tension adjuster means includes a flat bracket having side walls thereon, a cross member pivotally mounted on a pin intermediate said side walls, said single belt being threaded intermediate the flat bracket and the cross member, a serrated edge formed on a surface of said cross member adjacent said single belt, spring means operatively connected between said cross member and said pin to retain said serrated edge in a gripping engagement with the single belt to retain same in a predetermined position, and a pull strap connected to said cross member and extending through said front opening adapted to pivot said cross member and the serrated edge to release said single belt to permit manual adjustment thereof to selectively tighten the associated pair of shoulder belts around the child.

4. A vehicle seat as defined in claim 3 wherein extensions of said pair of shoulder belts through said connector members serve as thigh belts and are secured at their ends to respective rear corners of said support platform.

5. A vehicle seat integrated to selectively provide an adult seat in an adult seat mode and a child's seat in a child seat mode, said vehicle seat comprising

a seat cushion assembly operable to be mounted in a position within the vehicle to enable an adult occupant of the vehicle to sit thereon in an operative position,

rigid seat back frame means and means for mounting said rigid seat back frame means within the vehicle with respect to said seat cushion assembly

in an operative fixed relation,

side cushions carried by said seat back frame means in positions to be engaged by opposite sides of the back of an adult seat occupant sitting on said seat cushion assembly in said operative position,

said side cushions being spaced apart a distance sufficient to define a child receiving space therebetween of a size to enable a child to be disposed therebetween,

cushion assembly means mounted on said seat back frame means including movable cushion assembly means mounted for movement between (1) an adult mode position wherein said movable cushion assembly means is disposed within the space between said side cushions and provides adult back cushion means for engaging the middle of the back of an adult seat occupant sitting on said seat cushion assembly in said operative position, and (2) a child mode position wherein said movable cushion assembly means extends from the space between said side cushions and said cushion assembly means provides a cushioned child's seat extending from the bottom of the space in overlying relation to said seat cushion assembly, a cushioned child's seat back extending upwardly from said cushioned child's seat within the space between said side cushions, and a cushioned child's head support above the cushioned child's seat back,

said movable cushion assembly means including a pair of movable cushion assemblies movable together between (1) said adult mode position wherein a lower one of said pair of movable cushion assemblies extends upwardly and has an upper one of said pair of movable cushion assemblies extending thereabove and (2) said child mode position wherein the lower movable cushion assembly extends forwardly and has the upper

movable cushion assembly extending forwardly therefrom,

means for interconnecting said pair of movable cushion assemblies for said movement together  
5 and for limited articulating movement with respect to one another so as to accommodate different relative angular positions of abutment when in said adult mode and said child mode positions,

a child's seat belt assembly connected  
10 with said seat back frame means including a pair of shoulder belts extending forwardly of said cushioned child's seat back for extension over the shoulders of a small child sitting on the cushioned child's seat,

said lower movable cushion assembly  
15 providing a rigid anchor point for the child's seat belt assembly between the legs of a child sitting on said cushioned child's seat.

6. A vehicle seat as defined in claim 5 wherein said means for interconnecting said pair of  
20 movable seat cushion assemblies includes separable fastener means for selectively removing the upper movable seat cushion assembly from said lower movable seat cushion assembly.

7. A vehicle seat as defined in claim 5 wherein said rigid seat back frame means includes a  
25 rigid seat back frame structure to which said side cushions are secured, a rigid back panel of a size to fit within the space between the side cushions and means for fixedly mounting said rigid back panel on  
30 said rigid seat back frame structure forwardly thereof within a rearward portion of the space between said side cushions, said cushion assembly means and said

child's seat belt assembly being connected with said rigid back panel to form a child's seat module.

8. A vehicle seat as defined in claim 7 wherein said cushion assembly means includes a pad  
5 removably mounted on said lower movable seat cushion assembly and forwardly against said back panel.

9. A vehicle seat as defined in claim 8 wherein said pad is removably mounted by mating hook and loop strips mounted on said pad and on said lower  
10 movable seat cushion assembly and said back panel to removably retain said pad in place.

10. A vehicle seat as defined in claim 7 wherein said rigid back panel has means for enabling the pair of shoulder belts of said child's seat belt  
15 assembly to be conveniently moved into a plurality of vertically spaced positions with respect to said child's seat back to selectively accommodate a relatively small child or a relatively large child by simply manually grasping the shoulder belts extending  
20 forwardly of said cushioned child's seat back and moving them selectively into one of said plurality of vertically spaced positions, said means for enabling said movement of said shoulder belts comprising two horizontally spaced and generally horizontally aligned  
25 pairs of vertically spaced belt receiving restraint slots formed in said rigid back panel, each pair of restraint slots having a transfer slot extending from one of said restraint slots to the other of said restraint slots so as to define a cantilevered portion  
30 in said rigid back panel between the associated pair of restraint slots, said rigid back panel mounting means including brace means connected between each

cantilevered portion and said seat back frame structure for providing support from said seat back frame structure directly to each cantilevered portion while allowing the associated shoulder belt to be  
5 selectively moved within the associated transfer slot between the associated pair of restraint slots.

11. A vehicle seat as defined in claim 10 wherein said lower movable cushion assembly includes a support platform, said safety belt means including  
10 a crotch belt secured at one end thereof to said support platform, a buckle secured to the distal end of said crotch belt, said pair of shoulder belts having connector means operatively connected thereto adapted to snap into secured cooperating relation with  
15 said pair of shoulder belts selectively through a pair of restraint slots selected from each of said two pairs of restraint slots in said back panel adapted to connect with a dividing bracket, a single belt extending from said dividing bracket through said back  
20 panel and downwardly through a lower opening in said support platform and then upwardly through a front opening in said support platform with the free end thereof free to be manually gripped, and tension adjuster means operatively connected to said single  
25 belt beneath said support platform intermediate said front and rear openings therein.

12. A vehicle seat as defined in claim 11 wherein said tension adjuster means includes a flat bracket having side walls thereon, a cross member  
30 pivotally mounted on a pin intermediate said side walls, said single belt being threaded intermediate the flat bracket and the cross member, a serrated edge formed on a surface of said cross member adjacent said



single belt, spring means operatively connected between said cross member and said pin to retain said serrated edge in a gripping engagement with the single belt to retain same in a predetermined position, and  
5 a pull strap connected to said cross member and extending through said front opening adapted to pivot said cross member and the serrated edge to release said single belt to permit manual adjustment thereof to selectively tighten the associated pair of shoulder  
10 belts around the child.

13. A vehicle seat as defined in claim 12 wherein extensions of said pair of shoulder belts through said connector members serve as thigh belts and are secured at their ends to respective rear  
15 corners of said support platform.

14. A vehicle seat as defined in claim 7 wherein said lower movable cushion assembly includes a support platform, a continuous trough formed in said support platform a predetermined distance from an  
20 outer edge thereof and forming a central portion, a first plurality of spaced-apart holes formed in a ledge portion intermediate the trough and the outer edge thereof, a flat retainer mounted on said ledge portion including a second plurality of holes aligned  
25 with said first plurality of holes and a flange formed on the inner edge of said flat retainer for mounting in said trough, a plurality of fasteners mounted through said aligned first and second pluralities of holes, and a cover wrapped around said support  
30 platform, said flat retainer, and said flange to said central portion so as to be retained in said trough by said flange.

15. A vehicle seat as defined in claim 14 wherein said ledge portion intermediate the trough and the outer edge is on a plane lower than the central portion defined by said continuous trough, such that  
5 the outer surface of said flat retainer and overlying cover is coplanar with said central portion.

16. A vehicle seat as defined in claim 7 wherein said cushion assembly means includes a cover assembly pivotally mounted at the upper end of said  
10 back panel.

17. A vehicle seat as defined in claim 16 wherein said cover assembly includes a substantially C-shaped clamp adapted to flex to snap over a fixed metal support member, a cover member connected by  
15 connector means to the upper end of the C-shaped clamp, and fastener means formed adjacent the lower inner surface of the cover member to secure the latter to the underlying back panel.

18. A vehicle seat as defined in claim 7 wherein said back panel mounting means includes a pair of horizontally spaced brackets each having a leg thereof secured at a distal end thereof to said back panel and adapted to be secured to said vehicle, a pair of aligned openings formed through another end of  
20 each bracket and said mounting place for alignment with a corresponding opening in the vehicle, and a fastener for securement through each set of aligned openings and the associated corresponding vehicle opening.  
25

19. A vehicle seat as defined in claim 18 wherein each of said brackets is a U-shaped bracket  
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having a second leg thereof secured at the distal end thereof to a vertical member of the seat back frame structure.

20. A child's seat module for mounting on
- 5 the back seat frame of a vehicle seat having a seat cushion and spaced apart side cushions on the seat back frame defining a child-receiving space therebetween, said child's seat module comprising
- 10 a rigid back panel of a size to fit within the space between the side cushions having means for engaging with the back seat frame forwardly thereof within a rearward portion of the space between the side cushions for fixed securement thereto,
- 15 cushion assembly means mounted on said back panel including upper and lower movable cushion assemblies mounted for movement between (1) an adult mode position wherein said movable cushion assemblies are disposed within the space between the side cushions and provide adult back cushion means for
- 20 engaging the middle of the back of an adult seat occupant sitting on the seat cushion, and (2) a child mode position wherein said movable cushion assemblies extend from the space between the side cushions and said cushion assembly means provides a cushioned
- 25 child's seat including said lower movable cushion assembly extending from the bottom of the space in overlying relation to the seat cushion, a cushioned child's seat back extending upwardly from said cushioned child's seat within the space between the
- 30 side cushions, and a cushioned child's head support including said upper movable cushion assembly above the cushioned child's seat back,
- said movable cushion assembly means including a pair of movable cushion assemblies movable

together between (1) said adult mode position wherein a lower one of said pair of movable cushion assemblies extends upwardly and has an upper one of said pair of movable cushion assemblies extending thereabove and  
5 (2) said child mode position wherein the lower movable cushion assembly extends forwardly and has the upper movable cushion assembly extending forwardly therefrom,

means for interconnecting said pair of  
10 movable cushion assemblies for said movement together and for limited articulating movement with respect to one another so as to accommodate different relative angular positions of abutment when in said adult mode and said child mode positions,

15 a child's seat belt assembly connected with said seat panel and extending forwardly of said cushioned child's seat back for extension over the shoulders of a child sitting on the cushioned child's seat,

20 said lower movable cushion assembly providing a rigid anchor point for the small child's seat belt assembly between the legs of a small child sitting on said cushioned child's seat.

25 21. A child's seat module as defined in claim 20 wherein said means for interconnecting said pair of movable seat cushion assemblies includes a zipper for selectively removing the upper movable seat cushion assembly from said lower movable seat cushion assembly.

30 22. The child's seat module described in claim 20 wherein said means for interconnecting said pair of movable seat cushion assemblies includes a slide fastener for selectively removing the upper

movable seat cushion assembly from said lower movable seat assembly.

23. The child's seat module described in claim 22 wherein said slide fastener includes a first member including a generally U-shaped trough formed on one of said pair of movable seat cushion assemblies, a second member including a flanged longitudinal protrusion formed on another of said pair of movable seat cushion assemblies, and fastener means for securing trim edges of said pair of movable seat cushion assemblies to said first and second members.

24. The child's seat module described in claim 23 wherein said fastener means is stitching.

25. The child's seat module described in claim 23 wherein said second member includes a U-shaped end on one end thereof, and said fastener means includes a strip having a barb formed on one end thereof for mounting within said U-shaped end to be retained therein, and stitching for securing said strip at the end thereof opposite said barb to the adjacent trim edge.

26. A child's seat module as defined in claim 20 wherein said cushion assembly means includes a pad removably mounted on said lower movable seat cushion assembly and forwardly against said back panel.

27. A child's seat module as defined in claim 26 wherein said pad has at least its backside thereof covered by a flexible sheet material having a fabric-like pile outer surface is removably mounted by

hook strips mounted on said lower movable seat cushion assembly and said back panel to removably retain said pad in place.

28. A child's seat module as defined in  
5 claim 20 wherein said rigid back panel has means for  
enabling the pair of shoulder belts of said child's  
seat belt assembly to be conveniently moved into a  
plurality of vertically spaced positions with respect  
10 to said child's seat back to selectively accommodate  
a relatively small child or a relatively large child  
by simply manually grasping the shoulder belts  
extending forwardly of said cushioned child's seat  
back and moving them selectively into one of said  
15 plurality of vertically spaced positions, said means  
for enabling said movement of said shoulder belts  
comprising two horizontally spaced and generally  
horizontally aligned pairs of vertically spaced belt  
receiving restraint slots formed in said rigid back  
20 panel, each pair of restraint slots having a transfer  
slot extending from one of said restraint slots to the  
other of said restraint slots so as to define a  
cantilevered portion in said rigid back panel between  
the associated pair of restraint slots, and brace  
25 means connected to each cantilevered portion for  
connection with a seat back frame structure for  
providing support from the seat back frame structure  
directly to each cantilevered portion while allowing  
the associated shoulder belt to be selectively moved  
30 within the associated transfer slot between the  
associated pair of restraint slots.

29. A child's seat module as defined in  
claim 28 wherein said lower movable cushion assembly  
includes a support platform, said safety belt means

including a crotch belt secured at one end thereof to said support platform, a buckle secured to the distal end of said crotch belt, said pair of shoulder belts having connector means operatively connected thereto adapted to snap into secured cooperating relation with said pair of shoulder belts selectively through a pair of restraint slots selected from each of said two pairs of restraint slots in said back panel adapted to connect with a dividing bracket, a single belt extending from said dividing bracket through said back panel and downwardly through a lower opening in said support platform and then upwardly through a front opening in said support platform with the free end thereof free to be manually gripped, and tension adjuster means operatively connected to said single belt beneath said support platform intermediate said front and rear openings therein.

30. A child's seat module as defined in claim 29 wherein said tension adjuster means includes a flat bracket having side walls thereon, a cross member pivotally mounted on a pin intermediate said side walls, said single belt being threaded intermediate the flat bracket and the cross member, a serrated edge formed on a surface of said cross member adjacent said single belt, spring means operatively connected between said cross member and said pin to retain said serrated edge in a gripping engagement with the single belt to retain same in a predetermined position, and a pull strap connected to said cross member and extending through said front opening adapted to pivot said cross member and the serrated edge to release said single belt to permit manual adjustment thereof to selectively tighten the associated pair of shoulder belts around the child.

31. A child's seat module as defined in claim 30 wherein extensions of said pair of shoulder belts through said connector members serve as thigh belts and are secured at their ends to respective rear corners of said support platform.

32. A child's seat module as defined in claim 20 wherein said lower movable cushion assembly includes a support platform, a continuous trough formed in said support platform a predetermined distance from an outer edge thereof and forming a central portion, a first plurality of spaced-apart holes formed in a ledge portion intermediate the trough and the outer edge thereof, a flat retainer mounted on said ledge portion including a second plurality of holes aligned with said first plurality of holes and a flange formed on the inner edge of said flat retainer for mounting in said trough, a plurality of fasteners mounted through said aligned first and second pluralities of holes, and a cover wrapped around said support platform, said flat retainer, and said flange to said central portion so as to be retained in said trough by said flange.

33. A child's seat module as defined in claim 32 wherein said ledge portion intermediate the trough and the outer edge is on a plane lower than the central portion defined by said continuous trough, such that the outer surface of said flat retainer and overlying cover is coplanar with said central portion.

34. A child's seat module for mounting on the back seat frame of a vehicle seat having a seat cushion and spaced apart side cushions on the seat



back frame defining a child-receiving space therebetween, said child's seat module comprising

5 a rigid back panel of a size to fit within the space between the side cushions having means for engaging with the back seat frame forwardly thereof within a rearward portion of the space between the side cushions for fixed securement thereto,

cushion assembly means mounted on said back panel including upper and lower movable cushion assemblies mounted for movement between (1) an adult mode position wherein said movable cushion assemblies are disposed within the space between the side cushions and provide adult back cushion means for engaging the middle of the back of an adult seat occupant sitting on the seat cushion, and (2) a child mode position wherein said movable cushion assemblies extend from the space between the side cushions and said cushion assembly means provides a cushioned child's seat including said lower movable cushion assembly extending from the bottom of the space in overlying relation to the seat cushion, a cushioned child's seat back extending upwardly from said cushioned child's seat within the space between the side cushions, and a cushioned child's head support including said upper movable cushion assembly above the cushioned child's seat back,

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a child's seat belt assembly connected with said seat panel and extending forwardly of said cushioned child's seat back for extension over the shoulders of a child sitting on the cushioned child's seat,

30

said lower movable cushion assembly providing a rigid anchor point for the small child's seat belt assembly between the legs of a small child sitting on said cushioned child's seat,

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means for enabling the pair of shoulder belts of said child's seat belt assembly to be conveniently moved into a plurality of vertically spaced positions with respect to said child's seat back to selectively accommodate a relatively small child or a relatively large child by simply manually grasping the shoulder belts extending forwardly of said cushioned child's seat back and moving them selectively into one of said plurality of vertically spaced positions,

said means for enabling said movement of said shoulder belts comprising two horizontally spaced and generally horizontally aligned pairs of vertically spaced belt receiving restraint slots formed in said rigid back panel, each pair of restraint slots having a transfer slot extending from one of said restraint slots to the other of said restraint slots so as to define a cantilevered portion in said rigid back panel between the associated pair of restraint slots, said rigid back panel mounting means including brace means connected between each cantilevered portion and said seat back frame structure for providing support from said seat back frame structure directly to each cantilevered portion while allowing the associated shoulder belt to be selectively moved within the associated transfer slot between the associated pair of restraint slots.

35. A child's seat module as defined in claim 34 wherein said lower movable cushion assembly includes a support platform, said safety belt means including a crotch belt secured at one end thereof to said support platform, a buckle secured to the distal end of said crotch belt, said pair of shoulder belts having connector means operatively connected thereto

adapted to snap into secured cooperating relation with said pair of shoulder belts selectively through a pair of restraint slots selected from each of said two pairs of restraint slots in said back panel adapted to connect with a dividing bracket, a single belt extending from said dividing bracket through said back panel and downwardly through a lower opening in said support platform and then upwardly through a front opening in said support platform with the free end thereof free to be manually gripped, and tension adjuster means operatively connected to said single belt beneath said support platform intermediate said front and rear openings therein.

36. A child's seat module as defined in claim 35 wherein said tension adjuster means includes a flat bracket having side walls thereon, a cross member pivotally mounted on a pin intermediate said side walls, said single belt being threaded intermediate the flat bracket and the cross member, a serrated edge formed on a surface of said cross member adjacent said single belt, spring means operatively connected between said cross member and said pin to retain said serrated edge in a gripping engagement with the single belt to retain same in a predetermined position, and a pull strap connected to said cross member and extending through said front opening adapted to pivot said cross member and the serrated edge to release said single belt to permit manual adjustment thereof to selectively tighten the associated pair of shoulder belts around the child.

37. A child's seat module as defined in claim 36 wherein extensions of said pair of shoulder belts through said connector members serve as thigh

belts and are secured at their ends to respective rear corners of said support platform.

38. In a vehicle body seat structure having a seat cushion and backrest, an integrated child seat module adapted for mounting in a generally rectangular-shaped recess provided in said backrest, said child seat module comprising:

a back panel and an articulated seat back section, said back panel adapted to be mounted to said vehicle body so as to form a base wall of said recess;

said articulated seat back section including an upper bolster segment and a lower bolster segment which are articulated at their outer adjacent opposed edges by flexible and detachable hinge means;

said upper and lower segments adapted to being pivotally folded downwardly from the back panel onto the vehicle seat cushion with the lower bolster segment serving as a toddler's seat cushion and the upper segment serving as a toddler's leg support;

said recess formed in the seat back by the pivotal removal of the lower and upper segments adapted to serve as the back and side supports of the module;

a support platform pivotally mounted on the back panel intermediate said back panel and said lower segment for overlying said lower segment once pivoted down adjacent the vehicle seat cushion; and

suitable safety belt means operatively connected through said back panel and said support platform.

39. In a vehicle seat structure including a seat cushion and backrest, an integrated child seat module comprising a back panel, an upper segment of the seat back secured by fastener means to said back panel and adapted to being pulled away from and downwardly from the back panel to serve as a leg support, a lower segment of the seat back secured by a flexible hinge to the upper segment and adapted to being pivotally folded downwardly from the back panel along with the upper segment onto the automobile seat to serve as a child's seat portion, a recess formed in the seat back by the pivotal removal of the lower and upper segments adapted to serve as the back and side supports of the module, a support platform pivotally mounted on the back panel intermediate said back panel and said lower segment for overlying said lower segment once pivoted down onto the vehicle seat cushion, and suitable safety belt means operatively connected through said back panel and said support platform.

40. The child's seat module described in claim 39 wherein said flexible hinge includes a separable fastener means for selectively removing the leg support from the toddler's seat portion.

41. The child's seat module described in claim 39, and a pad removably mounted on said support platform and against said back panel.

42. The child's seat module described in claim 41, and mating hook and loop strips mounted on said pad and on said support platform and back panel to retain said pad in place.

43. The child's seat module described in claim 39, and adjustment slots formed in said back panel to accommodate changing the locations of the safety belt means therethrough.

5           44. The child's seat module described in claim 43 wherein said adjustment slots include two sets of vertically spaced apart lateral restraint slots for selectively seating the belt means therein, a vertical slot extending upwardly from each lower lateral restraint slot, a diagonal slot extending  
10           upwardly from the upper end of each vertical slot, a lateral opening extending from the juncture of the vertical and diagonal slots to a downward inlet into each upper lateral restraint slot of the spaced apart  
15           restraint slots.

          45. The child's seat module described in claim 39, and a continuous trough formed in said support platform a predetermined distance from the outer edge thereof and forming a central portion; a  
20           first plurality of spaced-apart holes formed in the ledge portion intermediate the trough and the outer edge; a flat retainer mounted on said ledge portion, including a second plurality of holes aligned with said first plurality of holes and a flange formed on  
25           the inner edge of said flat retainer for mounting in said trough; a plurality of fasteners mounted through said aligned first and second pluralities of holes; and a cover wrapped around said lower segment, said flat retainer, and said flange to said central portion  
30           so as to be retained in said trough by said flange.

          46. The child's seat module described in claim 39 wh rein said safety belt means includes a

crotch belt secured at one end thereof to said support platform, a buckle secured to the distal end of said crotch belt, a pair of shoulder belts having connector members operatively connected thereto adapted to snapping into said buckle, said pair of shoulder belts extending through openings formed in said back panel adapted to connect with a dividing bracket, a single belt extending from said dividing bracket through said back panel and downwardly through a rear opening in said support platform and thence upwardly through a front opening in said support platform with the free end thereof free to be manually gripped, and tension adjuster means operatively connected to said single belt beneath said support platform intermediate said front and rear openings therein.

47. The child's seat module described in claim 46 wherein said tension adjuster means includes a flat bracket having side walls thereon, a cross member pivotally mounted on a pin intermediate said side walls, said single belt being threaded intermediate the flat bracket and the cross member, a serrated edge formed on a surface of said cross member adjacent said single belt, spring means operatively connected between said cross member and said pin to retain said serrated edge in a gripping engagement with the single belt to retain same in a predetermined position, and a pull strap connected to said cross member and extending through said front opening adapted to pivot said cross member and the serrated edge to release said single belt to permit manual adjustment thereof to selectively tighten the associated pair of shoulder belts around the child.

48. The child's seat module described in claim 46, and extensions of said pair of shoulder belts through said connector members serving as thigh belts and secured at their ends to respective rear corners of said support platform.

49. The child's seat module described in claim 39, and a cover assembly pivotally mounted at the upper end of said back panel, above said upper segment.

50. The child's seat module described in claim 49 wherein said cover assembly includes a substantially C-shaped clamp adapted to flex to snap over a fixed metal support member, a cover member connected by connector means to the upper end of the C-shaped clamp, and fastener means formed adjacent the lower inner surface of the cover member to secure the latter to the underlying back panel.

51. The child's seat module described in claim 39 wherein said back panel is secured by mounting means to a body structural cross member.

52. The child's seat module described in claim 51 wherein said mounting means includes a bracket having a leg thereof secured at the distal end thereof to said back panel, and the other end thereof abutted against one side of said body structural cross member, a mounting plate secured to the other side of said body structural cross member, aligned openings formed through said other end of said bracket, said body structural cross member, and said mounting plate, and a fastener secured through said aligned openings.



53. The child's seat module described in claim 52 wherein said bracket is a U-shaped bracket having a second leg thereof secured at the distal end thereof to a vertical member of the seat back frame.

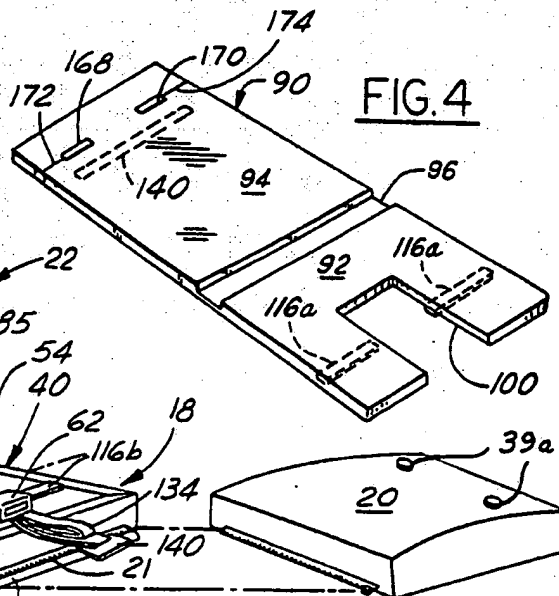
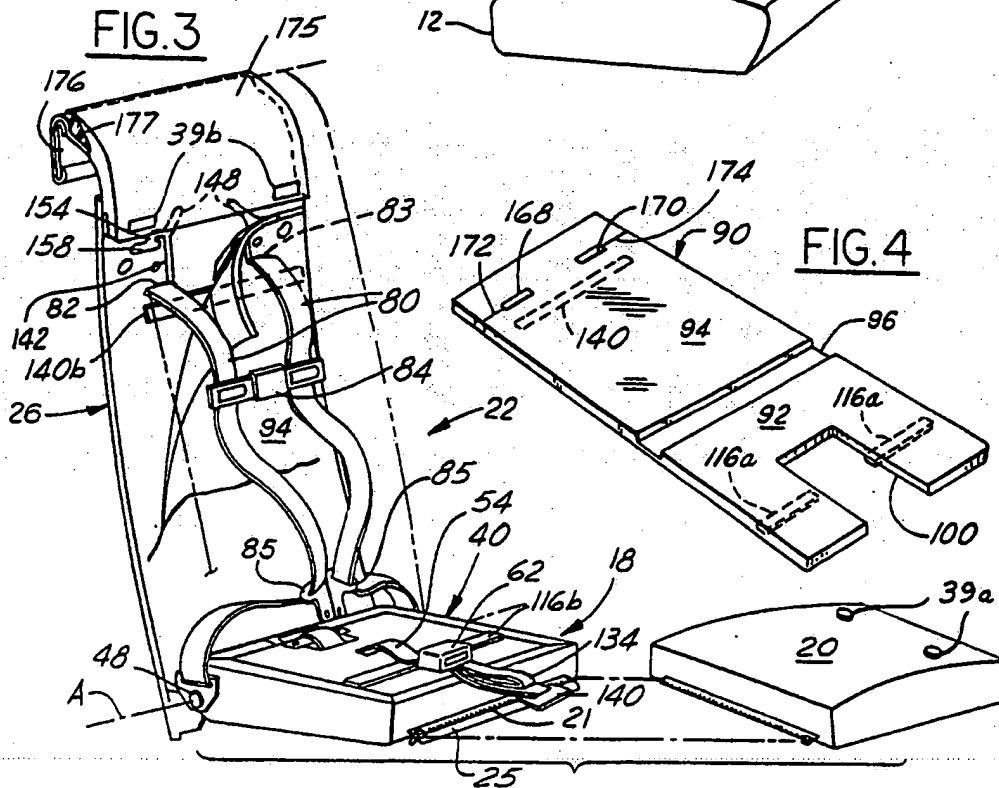
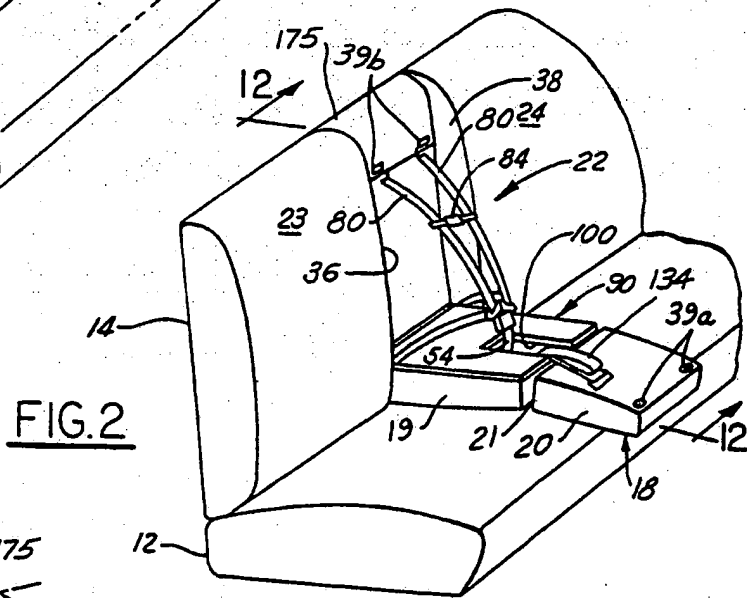
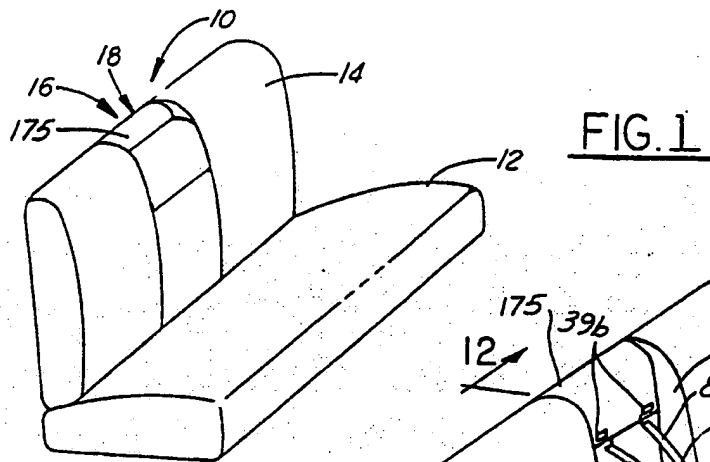
5 54. The child's seat module described in claim 39 wherein said flexible hinge includes a slide fastener for selectively removing the leg support from the toddler's seat portion.

10 55. The child's seat module described in claim 54 wherein said slide fastener includes a first member including a generally U-shaped trough formed on one of the leg support and toddler's seat portion, a second member including a flanged longitudinal protrusion formed on the other of the leg support and  
15 toddler's seat portion, and fastener means for securing respective leg support and seat portion trim edges to said first and second members.

56. The child's seat module described in claim 55 wherein said fastener means is stitching.

20 57. The child's seat module described in claim 55 wherein said second member includes a U-shaped end on one end thereof, and said fastener means includes a strip having a barb formed on one end thereof for mounting within said U-shaped end to be  
25 retained therein, and stitching for securing said strip at the end thereof opposite said barb to the adjacent trim edge.

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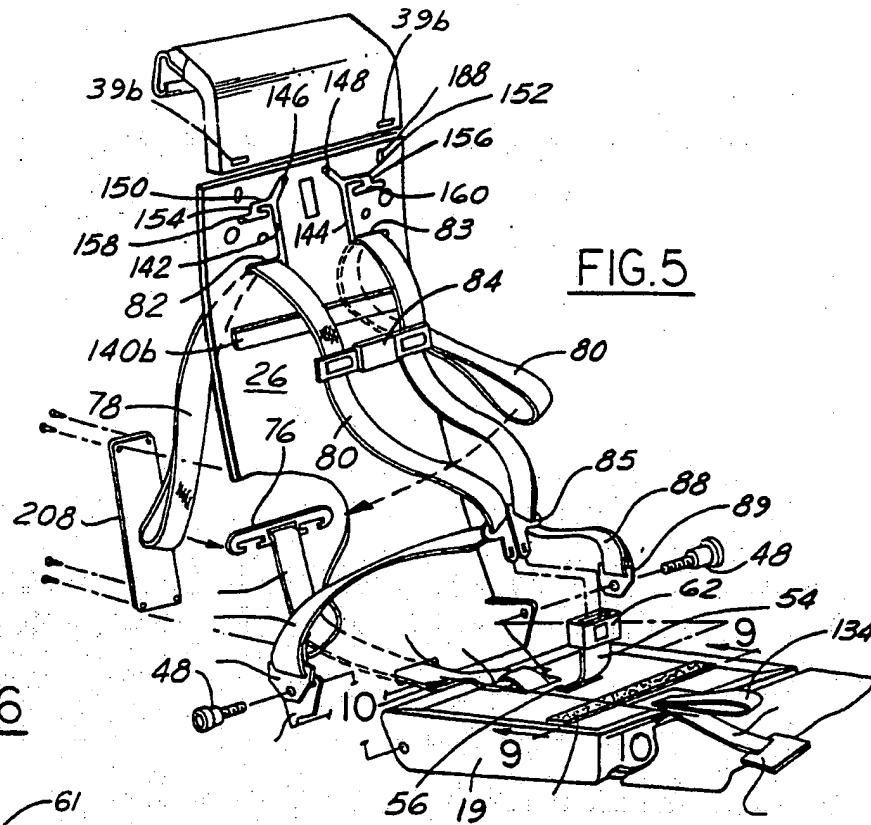


FIG. 5

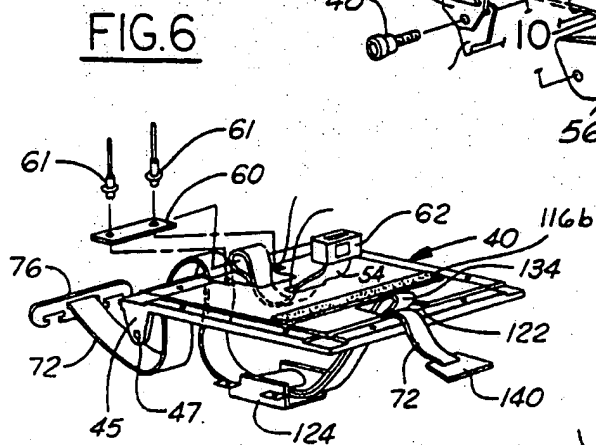


FIG. 6

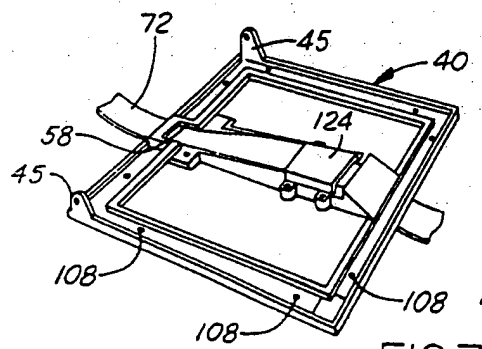


FIG. 7

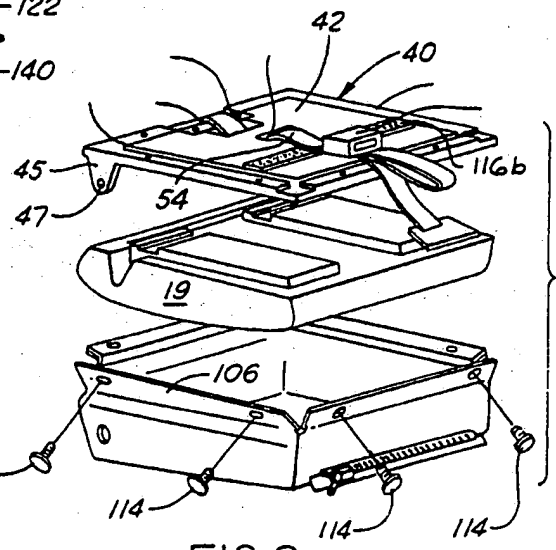


FIG. 8

- 3 / 8 -

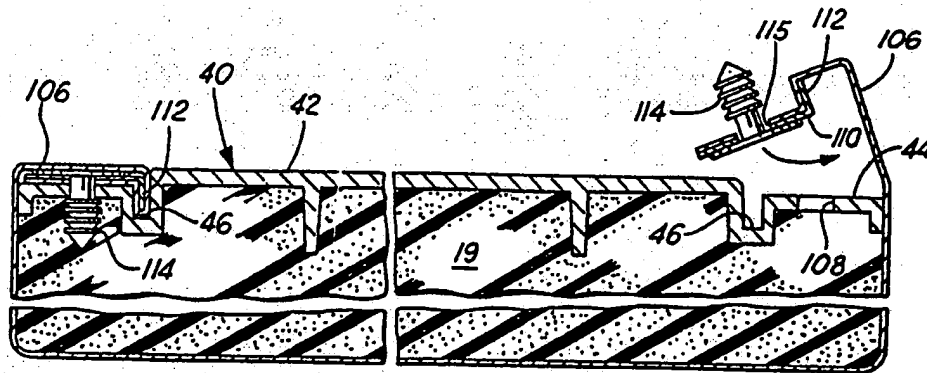


FIG. 9

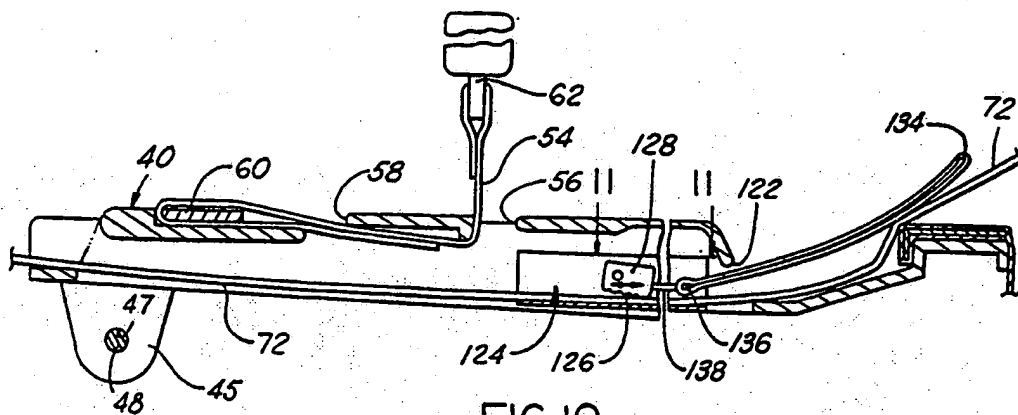


FIG. 10

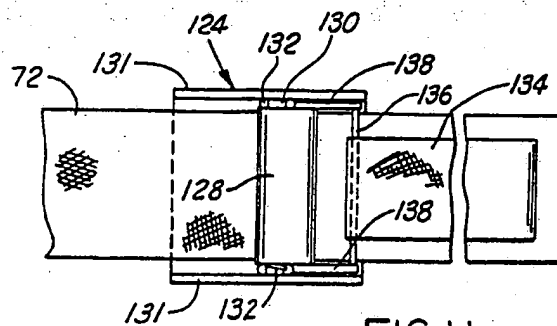
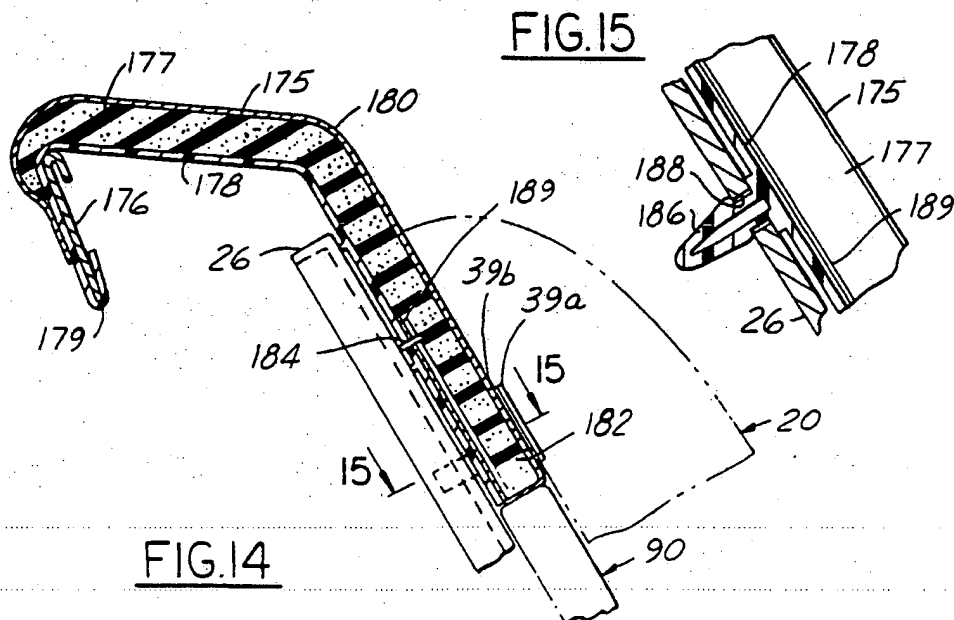
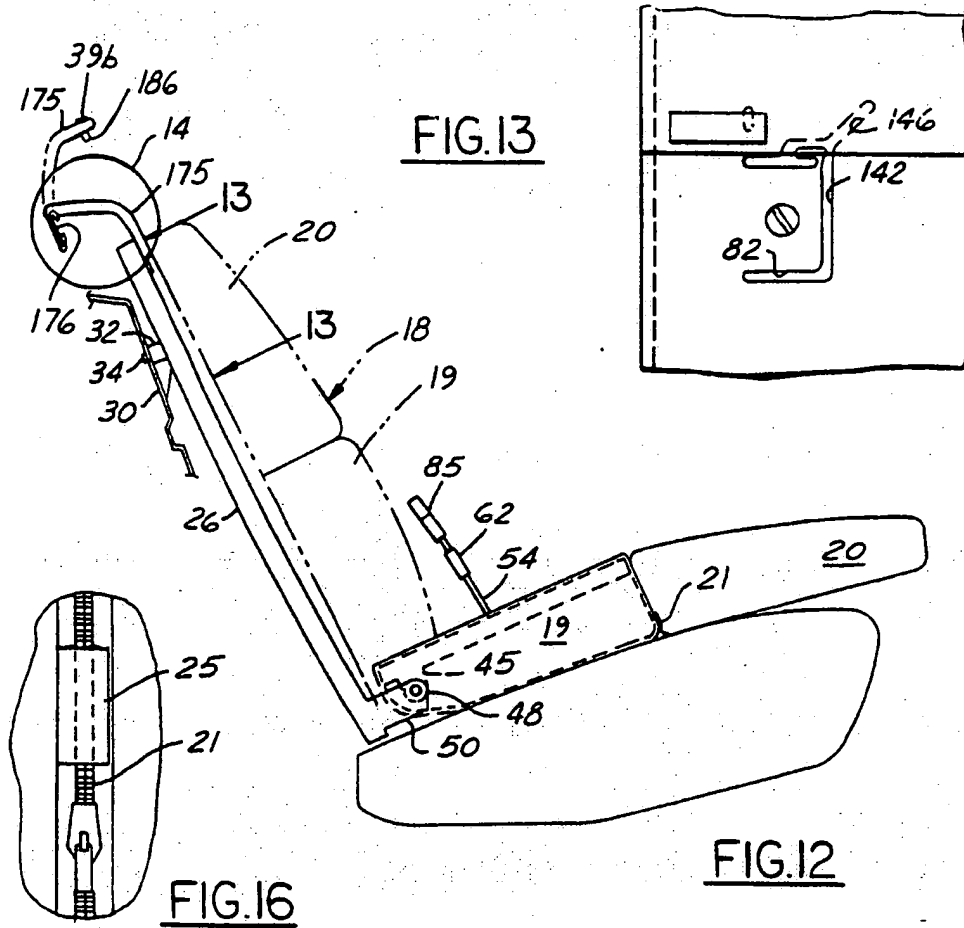


FIG. 11

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FIG.17

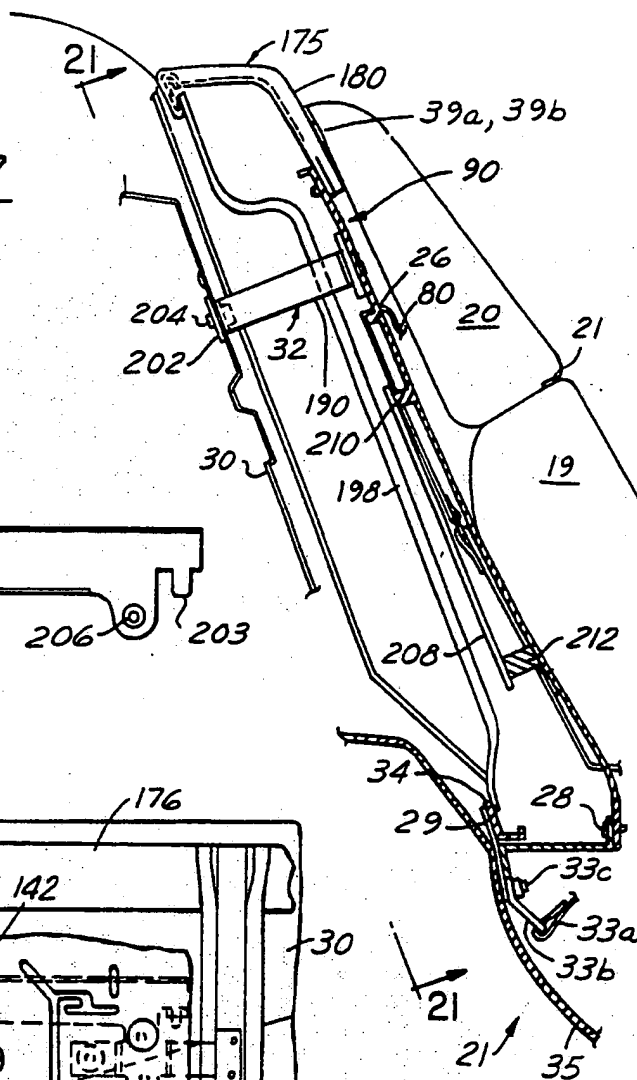


FIG.20

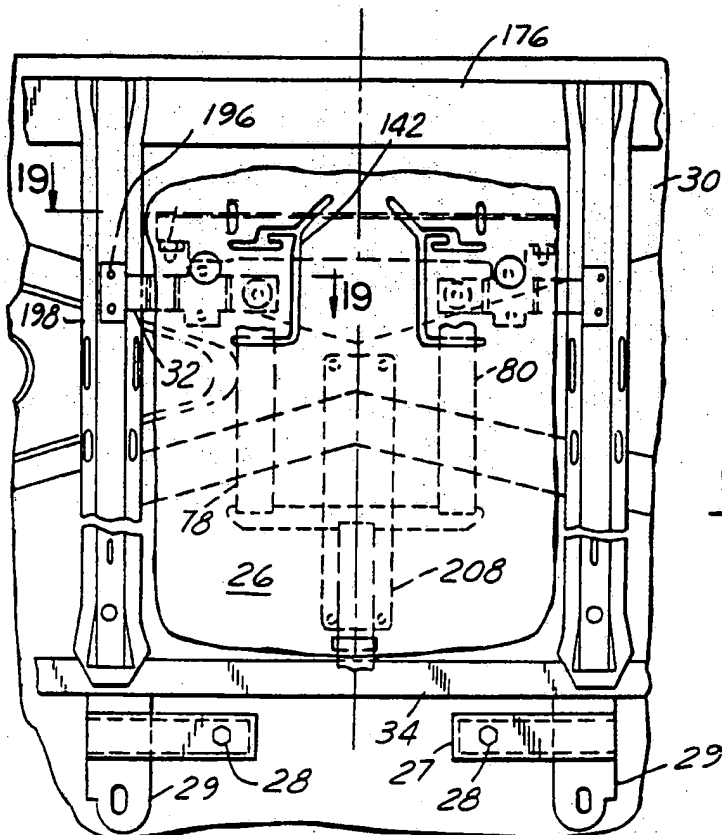
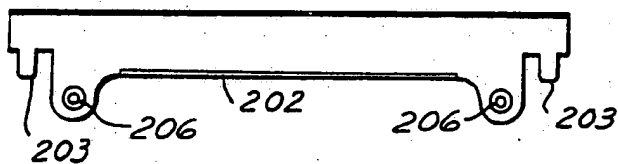


FIG.18

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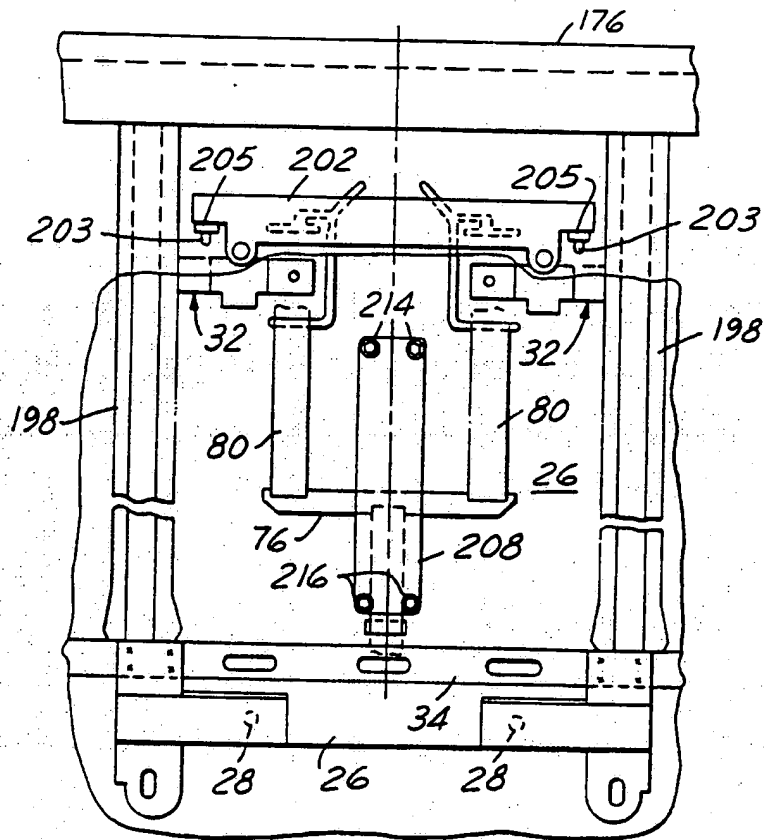


FIG. 21

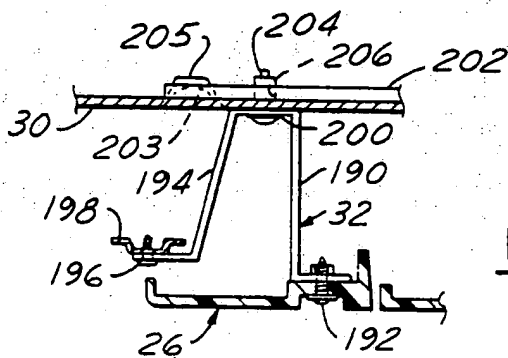


FIG. 19

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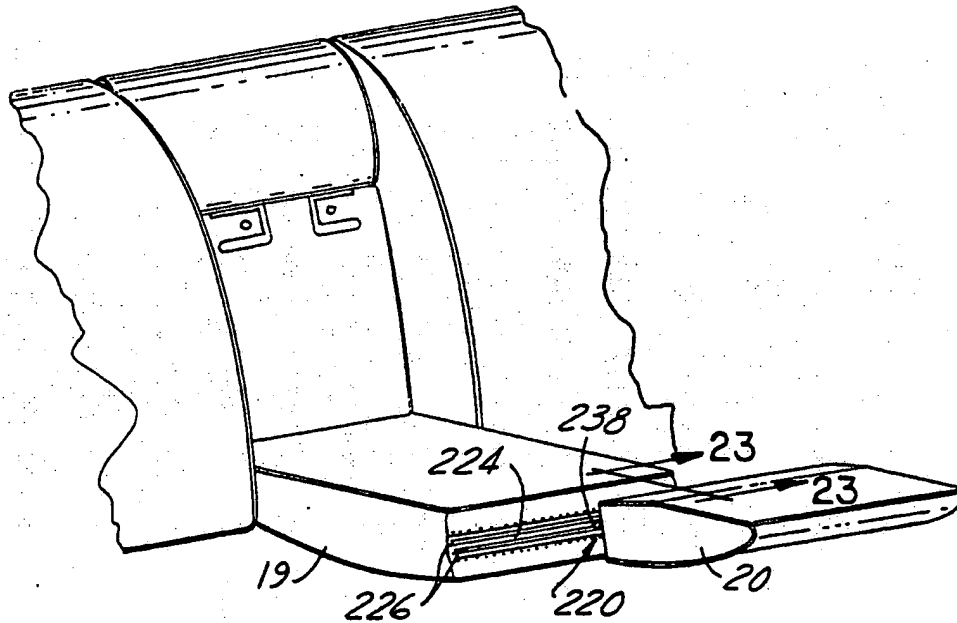


FIG. 22

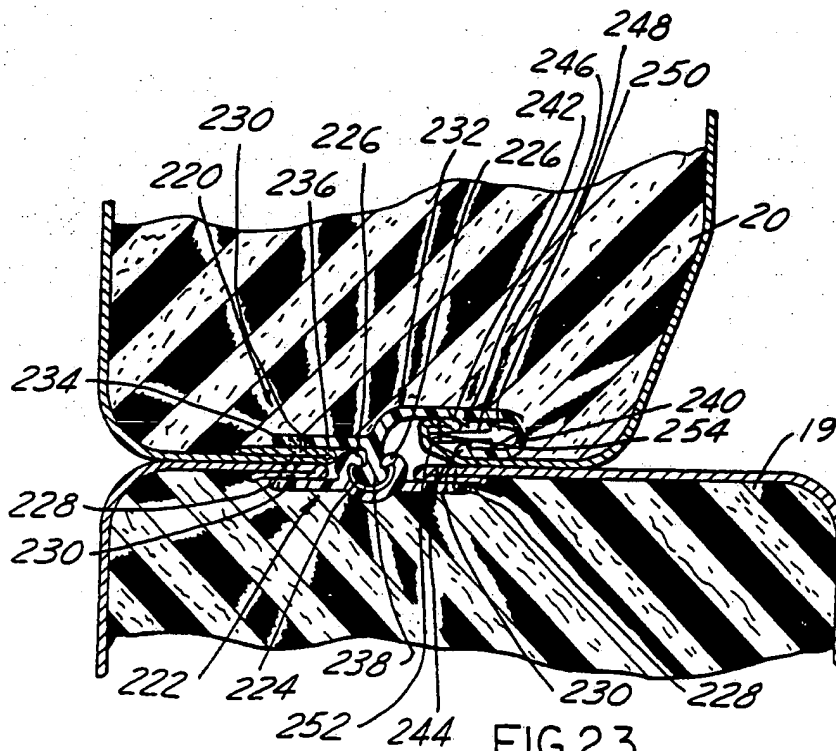


FIG. 23



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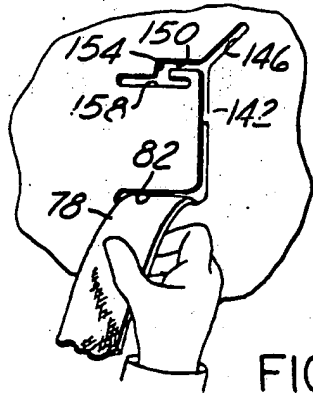


FIG. 24

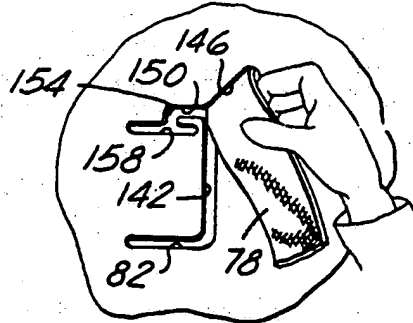


FIG. 25

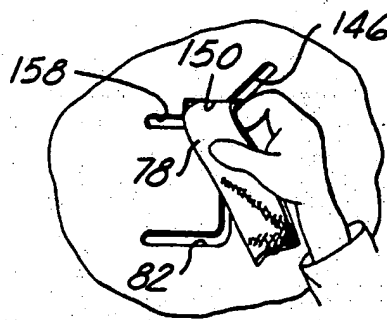


FIG. 26

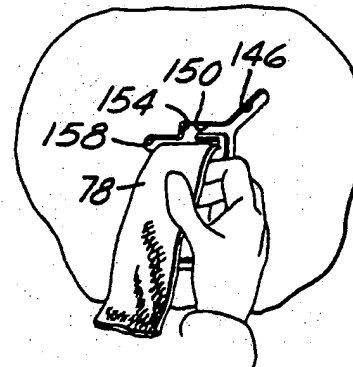


FIG. 27

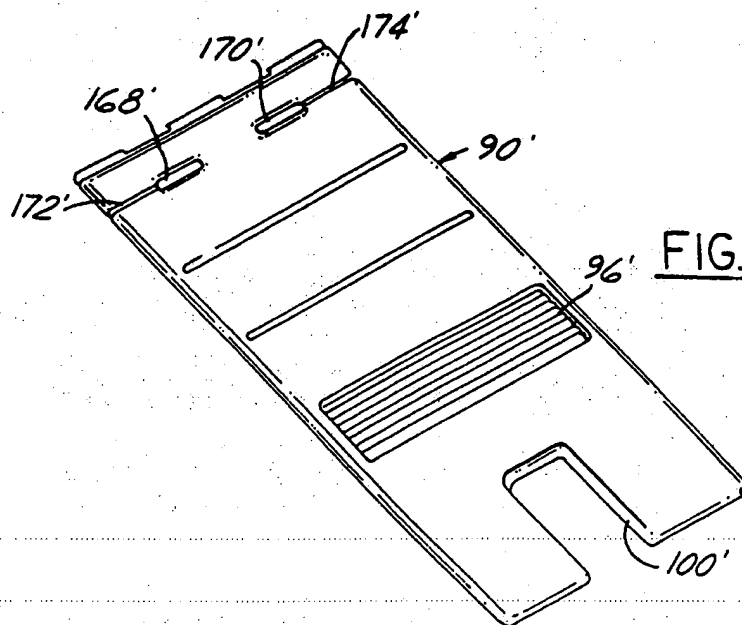


FIG. 28

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US93/04046

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :A47C 15/00

US CL :297/238,112,467

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 297/113,114,117254-256,468

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
<input checked="" type="checkbox"/> X Y,P	US,A, 5,135,285 (Dukatz et al.) 04 August 1992.	<u>1-3</u> 4-57
Y	US,A, 4,900,087 (Crisp) 13 February 1990.	5-57
Y	GB,A, 2,023,415 (Rainsford) 03 January 1990.	4-57
A	US,A, 4,900,086 (Steward) 13 February 1990.	1-57
A	US,A, 4,756,573 (Simin et al.) 12 July 1988.	1-57
A	US,A, 4,681,367 (Timmers) 21 July 1987.	1-57
A	US,A, 4,040,664 (Tanaka et al.) 09 August 1977.	1-57

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	* T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
* A document defining the general state of the art which is not considered to be part of particular relevance	* X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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* L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	* G document member of the same patent family
* O document referring to an oral disclosure, use, exhibition or other means	
* P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

09 JULY 1993

Date of mailing of the international search report

05 AUG 1993

Name and mailing address of the ISA/US  
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FOSTER NGOC HO  
INTERNATIONAL DIVISION

**INTERNATIONAL SEARCH REPORT**International application No.  
PCT/US93/04046**C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A, 4,685,741 (Tsuge et al.) 11 August 1987.	1-57
A	US,A, 4,880,277 (Takahashi et al.) 14 November 1989.	1-57
A	US,A, 5,039,169 (Bougher et al.) 13 August 1991.	1-57
A	US,A, 5,106,158 (Dukatz et al.) 21 April 1992.	1-57